

Toward the Core Network in the 5G Era

The core network, while not as conspicuous as smartphones or base-station antennas in daily life, plays an extremely important role in ensuring communications for customers using mobile phones and providing added value to voice and data communications. I personally have been involved in the development of the core network since entering NTT and have witnessed the change in communications protocol and equipment architecture from generation to generation. In particular, I feel that the conversion to Internet Protocol (IP) and adoption of virtualization were major turning points in the evolution of the core network, so I will focus on these two developments here.

Let me begin with the conversion of communications protocol to IP. In the past, communications control within the core network was performed by the No. 7 Common Channel Signaling System (No. 7 CCS) making it necessary to use No. 7 CCS dedicated network equipment. Today, however, GPRS Tunneling Protocol (GTP) and Diameter are used as LTE IP-based protocols, and in the Voice over LTE (VoLTE) system, encoded voice data are controlled by IP-network communications control protocols, namely, Session Initiation Protocol (SIP). In addition, No. 7 CCS functions can now be used on an IP network in the form of SIGNaling TRANsport (SIGTRAN). As a result, a network that exchanges voice, data, and communications control signals can today be configured with general-purpose equipment such as routers and switches that are widely used in the IT world. The use of IP technology, meanwhile, enables the construction of highly flexible and reliable networks.

Turning now to virtualization, the equipment making up the core network prior to the adoption of virtualization ran dedicated software on high-performance, high-reliability dedicated hardware. This made it difficult to select hardware as freely as one might desire. In the IT world, however, the operation of applications on the cloud has become common practice and the prompt and efficient provision of services in a form blind to hardware has become possible. Against this background, international discussions on enabling communication systems too to enjoy the advantages of IT technology got under way at European Telecommunications Standards Institute Industry Specification Group Network Functions Virtualisation (ETSI ISG NFV), and in March 2016, NTT DOCOMO began operation of a network virtualization platform conforming to ETSI ISG NFV architecture. This approach is enabling the use of low-cost, general-purpose hardware while speeding up the provision of services and improving network reliability at the time of a natural disaster or system fault. At present,



General Manager of Core Network
Development Department

Hiroyuki Oto

we are moving forward on virtualizing various types of existing equipment consisting of dedicated hardware.

Finally, I would like to touch upon future directions. NTT DOCOMO plans to launch 5G pre-services in September 2019 and 5G full-scale commercial services in spring 2020. The initial configuration of the network will be of a form that extends existing Evolved Packet Core (EPC) LTE switches, but to promote new business creation, which is a key objective of 5G, we have undertaken the research and development of new technologies for the core network. One of these is “slicing technology” that aims to provide optimal communications tailored to the increasingly diversified needs of industry by dividing up the network in a virtual manner. Another is Multi-access Edge Computing (MEC), which attempts to shorten the delay in the wired interval by exploiting the low-delay characteristics of the 5G wireless interval. The idea here is to locate servers and switches that perform processing closer to customer devices. Using these technologies in even more advanced ways requires that the core network be virtualized and flexible, and to this end, discussions on 5G Core (5GC) next-generation packet switches based on the “cloud-native” concept are taking place within the 3rd Generation Partnership Project (3GPP), a 5G international standards organization. At NTT DOCOMO, we are committed to becoming a world leader in the development of a core network for the 5G era by engaging in international collaborative activities and taking the lead in solving issues that arise when applying IT to the world of communications.